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PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Process for Treating Napped Fabrics and products thereof

We, BEACON MANUFACTURING COMPANY, Swannanoa, County of Buncombe, State of North Carolina, United States of America, a corporation organised under the laws of the State of Delaware, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a process for treating napped fabrics and more especially to a process for treating blanket fabric with a unique resinous composition that establishes and maintains the desired resilience in the napped surface and also the desired softness.

Napped untreated blanket fabric may have a relatively high loft originally but this property will be diminished substantially through normal use of the blanket. Also, untreated blankets made of synthetic fibers will shed the napped fibers quite extensively when laundered.

Attempts to eliminate these disadvantages by treatment of the blanket fabric with the usual synthetic thermosetting resins alone are not satisfactory because these resins render the fabric relatively stiff or harsh and boardy.

It has also been found unsatisfactory to treat the blanket fabric with thermoplastic type resins alone because they render the blanket "mushy" and give it a lifeless clammy feel.

The present invention consists in a chemically treated napped fabric having a high loft, permanent resilience, softness of hand and resistance to abrasion and shedding of the nap during use of the fabric and laundering thereof, said fabric having a surface of resilient upstanding napped fibers which are impregnated and coated with a heat reactive product of a resinous composition containing a thermosetting resinous component and a thermoplastic resinous component, said resinous composition being cured and forming an impregnant and a coating of the fibers throughout the napped surface of said fabric.

The invention also consists in a process for chemically treating a napped fabric to provide high loft, permanent resilience, softness of hand and resistance to abrasion and shedding of the nap during use of the fabric and laundering, comprising opening up the nap and maintaining the napped fibers in an upright position, applying to this napped fabric a mist or fog of a resinous composition containing a thermosetting resinous component which impregnates the fibers to impart the desired resilience and soft hand, and a thermoplastic resinous component which coats the fibers and causes them to cohere so as to resist shedding and drying and heating the thus treated fabric at a sufficiently high temperature to convert the resinous composition into permanent cured form.

Treatment of the fabric with the above composition should be carried out in a manner to effect thorough impregnation and coating of the napped fibers. One requirement for this result is to have the untreated napped fibers opened up and in upstanding position and to maintain them in this position during the resin treatment and the finishing operations.

A suitable mechanical arrangement for opening up and maintaining the napped fibers in open upstanding position is described and claimed in co-pending application Number 42417/64, Serial No. 1,046,070, filed 16th October 1964 and entitled Mechanisms and

[*Price 4s. 6d.*]

Methods for the Production and Treatment of Napped Fabrics. While the chemical process of this invention is not limited to a particular mechanical arrangement, it has been found to work very satisfactorily with the apparatus disclosed in said co-pending patent application, and serves the chemical counterpart or complement thereof for producing the desired resilient, anti-pilling and anti-shedding blanket nap. In this preferred process, the blanket fabric is first napped on a napping drum and the napped fabric fed over lead-in rolls, covered with napping clothing to maintain the napped fibers in upright position, and then fed on an endless conveyor member, through a closed chemical treating chamber and finally through a heating chamber for drying the fabric and curing the resin impregnant and coating, as illustrated, described and claimed in the said co-pending patent application.

The chemical treating process for the present invention takes place in the above mentioned closed chemical treating chamber and heating chamber. The present application being directed to a chemical process, independently of any specific apparatus used therefor, does not require illustration or detailed explanation of the equipment, but reference to the illustrations and description in the said co-pending application for details of one suitable form of apparatus may be made if desired.

For carrying out the chemical process of the present invention, a chemical composition comprising the following materials may be used:

Chemical Composition	Parts by Weight
Thermosetting resin, such as dimethylol ethylene urea, methylated methylol melamine, methylated dimethylol urea, dimethylol triazone	40
Partially polymerized water soluble urea formaldehyde resin	5 — 15
Thermoplastic resin, such as vinyl ketone/styrene copolymers, butadiene/styrene copolymer	15 — 20
Glycol such as ethylene glycol, diethylene glycol or triethylene glycol	7 — 12
Formaldehyde acceptor, such as urea or dicyandiamide	0 — 5
Buffering agent, such as triethanol amine, diethanolamine, or tris (hydroxy methyl) amino methane, to adjust the pH to 6.5 — 7.0	3 — 8

The procedure for mixing or compounding the above resinous formulation without catalyst is as follows:

The thermosetting resin and the glycol lubricant are mixed, and to this mixture is added the partially polymerized urea formaldehyde resin and the water and urea or other formaldehyde acceptor. This mixture is stirred, and to it is added the thermoplastic copolymer. The pH of the resulting mixture is then adjusted to a pH of 6.5 to 7 by adding the required amount of buffering agent. These mixing steps may all be carried out at normal or room temperature.

Depending upon the specific properties desired in the treated blanket and the specific chemicals used, some of the components in the above resinous composition may be varied. For example, the partially polymerized urea formaldehyde resin may vary from 5 to 15 parts; the thermoplastic copolymer may vary from 15 to 20 parts; and the formaldehyde acceptor may vary from 2 to 5 parts. The amount of water added depends upon the desired viscosity for shipping and ultimate handling of the liquid resinous composition. If necessary, a small amount, such as for example 1% or less, of an anti-foam may be used to control foaming of the composition.

The above composition may be catalysed with normal resin catalysts, such as amine hydrochloride, magnesium chloride and maleic acid, typical formulas for which are as follows:

Amine Hydrochloride Catalyst

	Parts by Weight
2 amino 2 methyl propanol-1	26
Muriatic acid 20° Bé	30
Water	44
Total	100

Magnesium Chloride Catalyst

	Parts by Weight
Magnesium chloride hexahydrate	64
Water	36
Total	100

Maleic Catalyst

	Parts by Weight
Maleic anhydride	50
Water	50
Total	100

(Adjust pH to 3.5 — 4.0 with ammonia)

The above resinous composition and catalyst are maintained separate during storage and shipment, and are mixed just prior to use of the composition for treatment of the napped blanket cloth in accordance with this invention.

In a typical operation carried out in accordance with this invention, a fifty gallon batch of the resinous composition and catalyst is made up by mixing one hundred and twenty pounds of the liquid resinous composition, in approximately two-thirds volume of water, and adding fifteen pounds of the liquid catalyst and then bringing the total volume to fifty gallons with water. This final mixture is applied in the form of a fine mist or fog onto both sides of the napped blanket fabric, as it passes through the above mentioned chemical treating chamber, this chamber being enclosed to maintain an atmosphere of the chemical in uniform, constant contact with the fabric, as it passes through the enclosed chamber. The fog or mist of treating chemical in this chamber penetrates the napped surfaces of the fabric to effect a thorough impregnation thereof with the chemical and it also forms a coating of the chemical on the napped fibers.

The passage of the napped fabric through the chemical treating chamber above described, is continuous and preferably constant and in a typical example may be at the rate of 30 yards of fabric per minute.

Promptly following treatment of the fabric in the treating chamber as above described, the resulting wet, napped fabric is passed through a heating chamber, which is heated in a suitable manner, for example with a flow of hot air through the chamber, or electrical heating units properly disposed in the chamber adjacent the path of the moving fabric. The speed of the fabric through this heating chamber and the temperature thereof are adjusted so as to effect drying of the fabric and curing of the resin components in the above described treating composition. In a typical case, the temperature in the heating chamber is maintained at 330° F., and the speed of the fabric is 30 yards per minute. During this drying and curing step of the

process, the conditions are such that the thermosetting resin component of the composition, e.g. the methylated dimethylol urea resin, and the partially polymerized urea formaldehyde resin, will crosslink with the cellulose in treated cellulosic fabric. These components impart to the treated napped fabric the above described desired resilience, which the untreated fabric does not possess. This is particularly true of the methylated dimethylol urea resin component, and the partially polymerized urea formaldehyde resin component gives the fabric the desired hand.

The thermoplastic component of the resinous composition forms the important function of coating the fibers and effecting cohesion therebetween which enables the fibers to resist abrasion encountered during normal use of the blanket and to resist shedding of the nap during use and laundering of the blanket.

The napped fabric which may be processed in accordance with the present invention may be composed of any of the textile fibers or mixtures of fibers, and the base fabric is usually a woven fabric although knitted or non-woven fabric may be used for the napping and chemical processing treatments. Typical examples of fibers which may be used in the fabric are cellulosic fibers, e.g. cotton and viscose rayon, and other natural fibers, such as wool; or blends of cellulosic fibers with synthetic fibers, such as nylon, and the acrylics, such as "Orlon", "Acrilan" and "Zefran", and polyester fibers. "Orlon", "Acrilan" and "Zefran" are Registered Trade Marks.

As above mentioned, it is important for the purposes of the present invention to use a resinous composition containing both the thermosetting resin component and the thermoplastic resin component which cofunction to give the desired properties in the final blanket. The properties of durable high nap, resilience, resistance to pilling and shedding and at the same time, the desired soft hand, cannot be obtained by use of either of these resin components without the other.

WHAT WE CLAIM IS:—

1. A chemically treated napped fabric having a high soft, permanent resilience, softness of hand and resistance to abrasion and shedding of the nap during use of the fabric and laundering thereof, said fabric having a surface of resilient upstanding napped fibers which are impregnated and coated with a heat reactive product of a resinous composition containing a thermosetting resinous component and a thermoplastic resinous component, said resinous composition being cured and forming an impregnant and a coating of the fibers throughout the napped surface of said fabric.

2. A chemically treated napped blanket having a high loft, permanent resilience, softness of hand and resistance to abrasion and shedding of the nap during use of the blanket and laundering thereof, said blanket having a surface of resilient upstanding napped fibers which are impregnated and coated with a heat reactive product of a resinous composition containing a thermosetting resinous component and a thermoplastic resinous component, said resinous composition being cured and forming an impregnant and a coating of the fibers throughout the napped surface of said blanket.

3. A chemically treated napped blanket as claimed in claim 2 made of cellulosic fabric, said resinous composition being crosslinked with the cellulose of the fabric and forming an impregnant and a coating of the fibers throughout the napped surface of said cellulosic blanket.

4. A napped cellulosic blanket as claimed in Claim 3, in which the thermosetting resin component of the resinous composition, before curing, is selected from dimethylol ethylene urea, methylated methylol melamine, methylated dimethylol urea, dimethylol triazone and partially polymerized urea formaldehyde resin, and the thermoplastic resin component is a vinyl ketone/styrene copolymer or a butadiene/styrene copolymer.

5. A process for chemically treating a napped fabric to provide high loft, permanent resilience, softness of hand and resistance to abrasion and shedding of the nap during use of the fabric and laundering, comprising opening up the nap and maintaining the napped fibers in an upright position, applying to this napped fabric a mist or fog of a resinous composition containing a thermosetting resinous component which impregnates the fibers to impart the desired resilience and soft hand, and a thermoplastic resinous component which coats the fibers and causes them to cohere so as to resist shedding and drying and heating the thus treated fabric at a sufficiently high temperature to convert the resinous composition into a permanent cured form.

6. A process as claimed in Claim 5 for chemically treating a napped cellulosic fabric, wherein the treated fabric is dried and heated at a sufficiently high temperature to effect crosslinking of the thermosetting resin component with the cellulose of the fabric and to convert the resinous composition into permanent cured form.

7. A process as claimed in Claim 5 or 6 and in which the thermosetting resin component of the resinous composition is dimethylol ethylene urea, methylated methylol melamine, methylated dimethylol urea, dimethylol triazone or partially polymerized urea formaldehyde resin, and the thermoplastic resin component is a vinyl ketone/styrene copolymer or a butadiene/styrene copolymer.

8. A process according to Claim 5 for chemically treating a napped fabric, substantially as hereinbefore described.

9. A napped blanket which has been treated by the process claimed in claim 5, 6, 7 or 8.

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